OREGON

Contact Information

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Program Description

Oregon DEQ (ORDEQ) has a history of using biological data in water quality assessments. Since the early 1990's the biomonitoring program has grown from two full time staff to nine current permanent staff, and over 15 during the summer field season. The principle objectives of the biomonitoring program are to:

- Assess the status of stream conditions and fish and macroinvertebrate assemblages across the state,
- Identify trends in stream conditions and biological assemblages,
- Identify the primary chemical and physical parameters impairing biological assemblages,
- Assess the effectiveness of restoration projects and management activities designed to improve stream conditions, and
- Help standardize protocols for biological assessments throughout the state and region

Increased concern over nonpoint sources of pollution and the listing of numerous salmon species as threatened or endangered has focused more attention on the importance of biological information in the State. In 1991 Oregon DEQ adopted narrative biocriteria into state water quality standards. ORDEQ is currently developing numeric biocriteria and expects to have numeric standards adopted by 2004.

Most biological data are collected using a probabilistic sampling design. A reference site network is also being developed and sampled. ORDEQ has worked closely with EPA and other state agencies in developing its monitoring strategy. Over 400 sites have been sampled for biological, chemical and physical parameters (approximately 150 sites per year). Currently biological data are incorporated into the State's 305(b) report and 303(d) list. Other biological data are used in NPDES permit assessments, CWA Section 401 permit applications, and beneficial use assessments.

Maintaining a commitment to long-term funding is one of the primary challenges of any state monitoring effort. Data management and data quality are also key issues that require ongoing efforts to maintain an effective program. Finally, integrating biological data into the overall water quality program (i.e. TMDLs) is an ongoing challenge and an area for improvement in the future. To view current ORDEQ biomonitoring technical reports, go to: http://www.deq.state.or.us/lab/Biomon/bio_rpt.htm

Documentation and Further Information

Oregon's 2000 Water Quality Status Assessment Report, Section 305(b) Report:
http://www.deq.state.or.us/wq/305bRpt/305bReport00a.pdf

ORDEQ Water Quality Limited Streams 303(d) List information (including Listing Criteria, etc.):
http://www.deq.state.or.us/wq/303dlist/303dpage.htm

Oregon Water Quality Standards homepage: http://www.deq.state.or.us/wq/standards/wqstdshome.htm

Quality Assurance Guidelines:
http://www.deq.state.or.us/lab/qa/NPDES%20and%20WPCF%20Self-Monitoring%20Laboratories.pdf

Mrazik, S. 1999. *Reference site selection: a six step approach for selecting reference sites for biomonitoring and stream evaluation studies*. Oregon Department of Environmental Quality, Biomonitoring Section.

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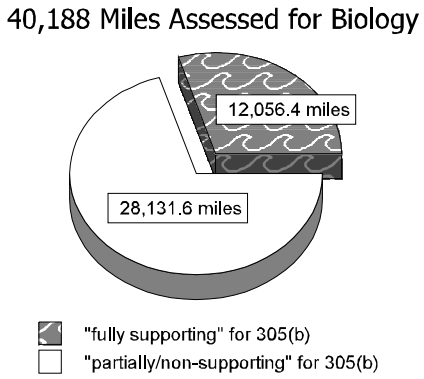
Programmatic Elements

Uses of bioassessment within overall water quality program	✓	problem identification (screening)
	✓	nonpoint source assessments
	✓	monitoring the effectiveness of BMPs
	✓	ALU determinations/ambient monitoring
	✓	promulgated into state water quality standards as biocriteria
		support of antidegradation
	✓	evaluation of discharge permit conditions
	✓	TMDL assessment and monitoring
	✓	other: 401 permits and restoration effectiveness monitoring
Applicable monitoring designs	✓	targeted (i.e., sites selected for specific purpose) *(special projects only)*
		fixed station (i.e., water quality monitoring stations)
	✓	probabilistic by stream order/catchment area *(specific river basins or watersheds)*
	✓	probabilistic by ecoregion, or statewide *(comprehensive use throughout jurisdiction)*
		rotating basin
		other:

Stream Miles

Total miles *(determined using RF3 and National Hydrography Database)*	**114,823**
Total perennial miles	51,695
Total miles assessed for biology*	**40,188**
fully supporting for 305(b)	12,056.4
partially/non-supporting for 305(b)	28,131.6
listed for 303(d)**	unknown
number of sites sampled *(on an annual basis)****	150+
number of miles assessed per site	–



*Most of the biological monitoring is based on a probabilistic sampling design in order to calculate the total stream miles represented by the data.

**ORDEQ is in the process of drafting a new 303(d) list (as of March 2002). If ORDEQ were to provide data based on past 303(d) lists, the number of miles listed would be considerably smaller than the 28,131 miles that are "partially/non-supporting" for 305(b) because 303(d) lists are *not* based on a probabilistic sampling design.

***Over 400 total sites have been sampled.

Aquatic Life Use (ALU) Designations and Decision-Making

ALU designation basis	Fishery Based Uses	
ALU designations in state water quality standards	Four designations: Salmonid Passage; Salmonid rearing; Salmonid spawning; Protection of resident fish and aquatic life	
Narrative Biocriteria in WQS	applied using a numeric approach found in 303(d) listing criteria, http://www.deq.state.or.us/wq/303dlist/303dpage.htm	
Numeric Biocriteria in WQS	under development	
Uses of bioassessment data in integrated assessments with other environmental data (e.g., toxicity testing and chemical specific criteria)	✓	assessment of aquatic resources
	✓	cause and effect determinations
	✓	permitted discharges
	✓	monitoring (e.g., improvements after mitigation)
		watershed based management
Uses of bioassessment/ biocriteria in making management decisions regarding restoration of aquatic resources to a designated ALU	The best example is a stream restoration project in Eastern Oregon that is trying to restore habitat and water quality to support salmonid spawning and rearing. Bioassessment data have been an ongoing part of this project's evaluation.	

Reference Site/Condition Development

Number of reference sites	**200 total**	
Reference site determinations		site-specific
		paired watersheds
	✓	regional (aggregate of sites)
	✓	professional judgment
	✓	other: see criteria below
Reference site criteria	Reference sites must fall into the lowest level of human disturbance based on a set of GIS information and field results including land use, road density and habitat (GIS data and best professional judgment are used to identify 5th field watersheds with minimal human disturbance). Once potential watersheds have been identified, stream monitoring sites are randomly selected from within those watersheds. Field reconnaissance confirms if they are suitable reference sites.	
Characterization of reference sites within a regional context		historical conditions
	✓	least disturbed sites
		gradient response
		professional judgment
	✓	other: minimally disturbed*
Stream stratification within regional reference conditions	✓	ecoregions (or some aggregate)
	✓	elevation
	✓	stream type
	✓	multivariate grouping
		jurisdictional (i.e., statewide)
	✓	other: gradient; latitude and longitude; conductivity; watershed area
Additional information		reference sites linked to ALU
	✓	reference sites/condition referenced in water quality standards
	✓	some reference sites represent acceptable human-induced conditions

*Oregon has three classes of reference sites: A - Sites with no human disturbance. These sites represent "natural" conditions and are generally found in wilderness areas or very remote regions of the state, B - Sites with minimal human disturbance. These sites represent conditions expected to occur without or with very minimal human activity, and C - Sites with human disturbance that measurably alters stream conditions. These are the best available (least disturbed) sites.

Field and Lab Methods

Assemblages assessed	✓	benthos *(100-500 samples/year; single season, multiple sites - broad coverage)*
	✓	fish *(100-500 samples/year; single season, multiple sites - broad coverage)*
	✓	periphyton *(<100 samples/year; single season, multiple sites - watershed level)* *NOTE: ORDEQ samples periphyton for some projects, but not at the majority of sites.*
	✓	other: amphibians and reptiles *(100-500 samples/year; single season, multiple sites - broad coverage)*
Benthos		
sampling gear		D-frame; 500-600 micron mesh
habitat selection		riffle/run (cobble)
subsample size		500 count
taxonomy		combination - typically genus/species. A regional (multistate) taxonomy workgroup meets to set taxonomic level standards.
Fish/Amphibians		
sampling gear		backpack electrofisher
habitat selection		multihabitat
sample processing		length measurement and anomalies
subsample		none
taxonomy		species
Periphyton		
sampling gear		**natural substrate**: brushing/scraping device (razor/toothbrush, etc.)
habitat selection		riffle/run (cobble)
sample processing		taxonomic identification
taxonomy		all algae
Habitat assessments		quantitative measurements; performed with bioassessments
Quality assurance program elements		standard operating procedures, quality assurance plan, periodic meetings and training for biologists, and specimen archival

Data Analysis and Interpretation

Data analysis tools and methods	✓	summary tables, illustrative graphs
	✓	parametric ANOVAs
	✓	multivariate analysis
	✓	biological metrics *(aggregate metrics into an index)*
	✓	disturbance gradients
		other:
Multimetric thresholds		
transforming metrics into unitless scores		25th percentile of reference population
defining impairment in a multimetric index		Cumulative distribution function
Multivariate thresholds		
defining impairment in a multivariate index		Significant departure from mean of reference population
Evaluation of performance characteristics	✓	repeat sampling *(a minimum of 10% of sites are sampled twice each field season)*
	✓	precision *(Signal-to-noise analysis)*
	✓	sensitivity *(Multivariate model sensitivity checked by rerunning model on subset of reference sites)*
		bias
		accuracy
Biological data		
Storage		Data are stored in an agency database using MS Access. Macroinvertebrate data are also being stored in a regional database (multi-agency and multi-state).
Retrieval and analysis		SAS and Statistica